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VIA ELECTRONIC FILING

March 13, 2019

Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: **Notice of Ex Parte Communications**
In the Matter of Amendments to Part 11 of the Commission's Rules Regarding the Emergency Alert System, PS Docket No. 15-94; and *In the Matter of Improving Wireless Emergency Alerts and Community-Initiated Alerting*, PS Docket No. 15-91

Dear Ms. Dortch:

On March 12, 2019, Ashruf El-Dinary, Vice President of Radio Technology Solutions for Xperi Corporation, together with the undersigned and Ari Meltzer of Wiley Rein LLP, met with the following representatives of the Public Safety and Homeland Security Bureau (PSHSB): Gregory Cooke, Deputy Chief, Policy and Licensing Division, PSHSB; Austin Randazzo, Chief, Cybersecurity and Communications Reliability Division, PSHSB; Linda Pintro, Attorney Advisor, Policy and Licensing Division, PSHSB; James Wiley, Attorney Advisor, Cybersecurity and Communications Reliability Division, PSHSB; and Rasoul Safavian, Senior Technical Advisor, PSHSB.

Xperi Corporation is the developer and licensor of HD Radio technology, which is the standard for digital radio broadcasting in North America. During the meeting, we discussed how HD Radio technology can upgrade and enhance the nation's emergency alerting capabilities as further detailed in the attached White Paper entitled "*Upgrading the Emergency Alert System: HD Radio Digital Emergency Alerting*," which was also presented to the attendees. Specifically, we emphasized the many emergency alerting features enabled by the HD Radio system – including, among other things, enhanced text notifications, multilingual audio and text, the ability to provide geographically-targeted information, "wake-up" signaling, and the ability to deliver visual images (e.g., pictures, maps) – and encouraged the PSHSB to consider the important role that HD Radio technology can play in the FCC's efforts to improve the nation's overall public alerting and warning system.

Pursuant to Section 1.1206(b)(2) of the Commission's Rules, 47 C.F.R. § 1.1206(b)(2), a copy of the written material provided in the meeting is attached hereto.

Respectfully Submitted,

/s/ John M. Burgett

John M. Burgett
Counsel for Xperi Corporation

Attachment

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UPGRADING THE EMERGENCY ALERT SYSTEM: HD RADIO™ DIGITAL EMERGENCY ALERTING

XPERI

Xperi Corporation is the developer and licensor of HD Radio technology which utilizes the In-Band On-Channel (IBOC) digital radio broadcast transmission system developed originally by iBiquity Digital Corporation. iBiquity Digital Corporation is a wholly-owned subsidiary of DTS, Inc., which in turn is a wholly-owned subsidiary of Xperi Corporation.

February 2019

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1 Executive Summary

Public alerting systems disseminate critical information to the public about impending and ongoing emergencies. Although the nation's public alerting systems date back almost 70 years, in recent years the Federal Communications Commission (FCC) and the Federal Emergency Management Agency (FEMA) have focused on modernizing the systems to achieve the goal of delivering emergency information that is timely, accurate, and actionable.

The cornerstone of today's public alerting systems is FEMA's Integrated Public Alert and Warning System (IPAWS), which includes the broadcast Emergency Alert System (EAS) and cellular phone-based Wireless Emergency Alerts (WEA). These systems enable the President to address the American public during a national emergency and allow state and local authorities to deliver important emergency information, such as AMBER alerts and weather information targeted to specific areas. In times of emergency, EAS messages distributed through participating broadcast, cable, and satellite operators (EAS Participants) and WEA alerts distributed over the networks of participating Commercial Mobile Service (CMS) providers work together in a complementary fashion to provide resiliency and redundancy for our nation's warning network.

Despite recent advancements in the nation's public alerting capabilities, a December 2018 report by the FCC's Communications Security, Reliability and Interoperability Council (CSRIC) recommended upgrading several aspects of the public alerting ecosystem, including:

- ❑ Improving geographic targeting;
- ❑ Enhancing public alerting systems with multimedia;
- ❑ Improving resiliency and redundancy;
- ❑ Improving the accessibility of alert information; and
- ❑ Encouraging the integration of public alert information across devices.

Digital radio technology—through the HD Radio system—can enable these improvements now and should be utilized as an integral part of the collaborative effort to upgrade the nation's public alerting capabilities. With HD Radio technology, federal, state, local, and tribal authorities can greatly improve the nature and quality of their critical efforts to notify the public of Presidential directives, national security alerts, AMBER alerts, weather-related events, and other emergency situations. Radio broadcasters can utilize the audio and data channels of their HD Radio signal to send various enhanced alert information, including text notifications, image data and location information, and multilingual announcements. As of January 2019, there are more than 327 HD Radio stations in 85 markets (including 46 of the top 50 markets) transmitting emergency alert text notifications to their listeners with HD Radio receivers.[1] Digital radio receivers capable of receiving enhanced emergency alert notifications also can "wake-up" from a sleep state to notify the public of local emergencies. As a complement to other emergency alerting methods, HD Radio technology can enhance EAS with many of the advanced features and attributes recommended by the FCC and FEMA to provide greater resiliency, redundancy, and accessibility in the nation's public alerting ecosystem.

Going well beyond the alerting capabilities of analog radio transmissions, HD Radio technology allows digital broadcasters to upgrade the usefulness of the emergency information conveyed and ensure that such information reaches people when and where they need it most.

2 What is HD Radio Technology?

HD Radio technology allows for the introduction of compatible digital radio broadcasting in existing AM and FM bands without the requirement for any new spectrum. HD Radio stations broadcast a digital signal over traditional radio frequencies allowing for the transmission of additional audio programming streams (*i.e.*, multicast channels) on a single frequency. In addition to the digital audio quality, crystal clear reception and multicasting enabled by the HD Radio system, the technology also permits radio stations to transmit varied and robust data services, including text and images. HD Radio devices require no Internet connection or subscription fees. Stations using HD Radio technology currently transmit a hybrid analog/digital signal on their present frequencies, thus allowing those listeners with existing analog radios to continue receiving the station's signal while those listeners with digital radios can enjoy the enhanced features enabled by the HD Radio service.

The HD Radio system's In-Band On-Channel (IBOC) digital radio broadcast transmission standard, a mature technology, serves as the standard for digital radio broadcasting in North America. The HD Radio service has operated commercially for more than a decade in the United States and is expanding in Mexico and Canada. HD Radio receivers include new car infotainment systems, home or automobile radios, and portable devices. The receivers are factory installed with top automakers and available from leading electronics brands.

As of January 2019, across the United States, more than 2,300 radio stations currently broadcast digitally using HD Radio technology.[2] These stations offer more than 1,950 extra multicast channel options.[3] Approximately 90% of the U.S. population live within reception distance of an HD Radio station, and an HD Radio signal can be received in each of the top 100 Nielsen-rated markets.[4] Currently, more than 50 million HD Radio-equipped cars are on the road.[5] With a mature transmission technology and more than 365 million hours of programming and service content each week, HD Radio broadcasting provides a stable digital radio service infrastructure.[6]

3 Overview of the Current Public Alerting Ecosystem

3.1 The Public Alerting Ecosystem

There are a wide range of public alerting systems, including those governed or funded by federal, state, and local governments (EAS and WEA), free platforms (television and radio broadcasts, social media, sirens), fee-based platforms (paid mobile applications), and those integrated with product offerings (in-vehicle infotainment systems, smart home devices). Some alerting methods use more traditional technologies, while others leverage emerging technologies.[7] Although multiple methods exist for dissemination and distribution of emergency alerting information, as recently emphasized by CSRIC, it is paramount that the system and technologies used provide:

- Resiliency
- Redundancy
- Accessibility[8]

Several key elements of the public alerting ecosystem are detailed in the subsections below.

3.1.1 Integrated Public Alert and Warning System (IPAWS)

FEMA manages IPAWS, the nation's alerting and warning infrastructure. IPAWS provides public safety officials the ability to alert and warn the public about serious emergencies using EAS, WEA, National Oceanic and Atmospheric Administration (NOAA) Weather Radio, and other public alerting systems from a single interface.[9] As of this writing, HD Radio technology is being installed into FEMA's IPAWS Lab at the Naval Surface Warfare Center in Indian Head, Maryland, to allow emergency management authorities the opportunity to educate themselves about HD Radio's enhanced emergency alerting capabilities.

3.1.2 The Emergency Alert System (EAS)

EAS serves as a national public warning system through which EAS Participants deliver alerts to the public to warn them of impending emergencies.[10] EAS Participants include: terrestrial broadcasters, cable television systems, wireless cable systems, satellite digital audio radio service providers, direct broadcast satellite service providers, and wireline video systems.[11] The primary purpose of EAS is to provide the President of the United States with "the capability to provide immediate communications and information to the general public at the National, State and Local Area levels during periods of national emergency."[12] This capability has yet to be used. More commonly, state and local authorities use EAS to deliver important emergency information, such as AMBER alerts. The NOAA's National Weather Service (NWS) also regularly uses the system to disseminate emergency weather alerts and advisories.[13]

There are two distribution methods for EAS alerts. The traditional method uses a hierarchical, broadcast based distribution system. An alert originator formats an alert using the EAS messaging protocol detailed in the FCC's rules ("EAS Protocol") and relays it from one designated station to another until it is fully distributed, commonly referred to as a "daisy chain."[14] At its initial level, the EAS "daisy chain" consists of various FEMA-designated broadcast stations – known as Primary Entry Point (PEP) stations –tasked with receiving and transmitting Presidential-level messages initiated by FEMA. As the entry point for national level EAS messages, FEMA designates these PEP stations as "National Primary" (NP) stations. At the next level (*i.e.*, below the PEP stations), designated "State Primary" stations monitor specifically-designated PEP stations and retransmit the Presidential-level alert, as well as state-level EAS messages originating from the Governor or a designated official at the State Emergency Operations Center. At the level below the State Primary stations, Local Primary (LP) stations monitor the State Primary and PEP stations. In turn, all other EAS Participants (radio and television broadcasters, cable operators, etc.) monitor LP stations. The LP stations must monitor at least two EAS sources for Presidential messages (including State Primary stations and in some cases a regional PEP station), and they also can serve as the point of contact for state and local authorities and the NWS to activate the EAS for localized events such as severe weather alerts.[15]

The second distribution method for EAS alerts utilizes IPAWS. Under this method, EAS Participants monitor a FEMA-administered website for EAS messages that are written in the Common Alerting Protocol (CAP), an international standard used by IPAWS to send public alerts and warnings.[16] CAP is a digital format for exchanging emergency alert information that allows a consistent alert message to be disseminated simultaneously over many different public alerting systems.[17] IPAWS relies upon the centralized distribution of alerts by using an alert aggregator and an Internet-based interface, whereas the EAS's "daisy chain" leverages the broadcast-based EAS distribution architecture as set forth in each state's EAS plan. [18]

In 2012, the FCC mandated that EAS Participants be able to receive CAP-formatted alert messages and convert them into messages formatted in the current EAS Protocol.[19] Some EAS Participants utilize "intermediary devices": standalone devices that carry out the functions of monitoring, receiving, and decoding CAP-formatted messages and converting such messages into a format that can be inputted into a separate, standalone legacy EAS device to provide an EAS Protocol-compliant message.[20] However, these intermediary devices do not have notable enhanced capabilities and functions of other CAP compliant alerting tools.[21] As CSRIC recently reported, "[w]hile the CAP information is more 'rich' than the original EAS provided for, much of the CAP message extended data is lost once the message is converted to EAS, including alternate languages, message text, pictures, video, maps, etc."[22] As described further below, HD Radio technology is CAP-compatible, thus allowing dissemination of all the rich messaging content enabled by CAP.

3.1.3 Wireless Emergency Alerts (WEA)

WEA alerts provide a secondary system that allows customers who own certain wireless phones and other enabled mobile devices to receive geographically-targeted, text-like messages alerting them of imminent threats to safety in their area.[23] WEA messages are sent via a secure Internet-based interface by a participating CMS provider to mobile customers' cellular devices.[24]

3.2 Federal Oversight of the Emergency Alert System (EAS)

FEMA, in conjunction with the FCC and the NWS, implements the EAS.[25] FEMA is responsible for federal-level activation of the EAS, tests, and related exercises. The FCC's role includes prescribing rules that establish technical standards for the EAS, procedures for EAS Participants to follow upon EAS activation, and EAS testing protocols. Additionally, the FCC ensures that the EAS state and local plans developed by industry conform to FCC EAS rules and regulations.[26] The NWS develops emergency weather information to alert the public about imminent dangerous weather conditions that can be pushed out over the EAS.

3.3 Current Capabilities, Challenges, and Recommendations

During emergencies, the public needs timely, accurate, and actionable information. An effective system to alert the public during emergencies is critical for saving lives and reducing property damage. This system must be resilient in times of emergency, include redundancies to ensure reliability, and provide accessibility to reach the maximum number of individuals. Radio plays a particularly important role in the public alerting system, providing a combination of portability and reliability that cannot be matched by other technologies. Accordingly, the Department of Homeland Security recommends that Americans include a "battery-powered or hand crank radio" in their Basic Emergency Supply Kit.[27]

While Congress, FEMA, the FCC, industry participants, and other organizations have made significant improvements implementing, testing, and utilizing the nation's various public alert and warning mechanisms, it is universally recognized that these mechanisms can and should continue to improve by leveraging ongoing advancements in technology.[28]

In addition to the FCC's rulemaking efforts to "ensur[e] that alerting mechanisms leverage advancements in technology,"[29] Congressional hearings and legislative efforts have also focused on improving the nation's overall alerting capabilities through technological enhancements.[30] Specifically, in recognition of

the fact that "when catastrophe looms and the lives of hundreds, thousands, even millions, are at risk or a child is missing, the necessity of ensuring the best available tools are available to local, state, and federal authorities to alert the public cannot be understated,"[31] Congress directed FEMA in 2015 to consider new and developing technologies that may be beneficial to the overall public alerting and warning system.[32]

In view of the government's strong desire to utilize advancements in technology to enhance the capabilities and quality of the nation's alerting systems, CSRIC recently conducted a comprehensive evaluation of emergency alerting and emerging technologies. CSRIC is a technical advisory board made up of government and industry experts established to provide the FCC with recommendations on a range of public safety and homeland security-related communications matters.[33] In December 2018, CSRIC published its Final Report on a *Comprehensive Re-Imagining of Emergency Alerting,* which includes several recommendations for upgrading the nation's current emergency alerting capabilities, including to:[34]

- ❑ Improve Geographic Targeting on Mobile and Stationary Devices
- ❑ Enhance Public Alerting Systems with Multimedia Which Facilitates Public Action-taking
    - o Alerting systems should carry text, graphics, audio, and other multimedia in or referenced by the alert.
- ❑ Make Public Alerting Systems Resilient and Redundant
- ❑ Improve the Accessibility of Alert Information for All People
- ❑ Increase Outreach to Encourage the Integration of Public Alert Information Across Consumer Electronics, Electronic Media, and Public Displays
    - o Extensive outreach should be conducted to encourage the integration and display of public alert information across the spectrum of consumer electronics including, but not limited to, cell phones and other mobile devices, television and radio, smart home devices/systems, and in-vehicle navigation/infotainment systems.[35]

Digital radio technology—namely, HD Radio technology—is available now and can be deployed to upgrade and improve emergency alerts as recommended by CSRIC and many other stakeholders.

3.4 The Many Components of the Public Alerting System Work Together to Provide Resiliency, Redundancy, and Accessibility

Enhancements to EAS, including through digital radio broadcasting, improve upon ongoing efforts to strengthen the public alerting system through complement components.

The most recent major expansion of the nation's public alerting system is the WEA system. Deployed in 2012, the WEA system allows authorized federal, state, and local government entities to target geographically all three alert categories – Presidential, Imminent Threat, and AMBER – to the WEA capable mobile devices of participating CMS providers' subscribers.[36] WEA alerts are distributed to certain end-users with mobile devices in contrast to EAS alerts, which are broadcast across a variety of networks more broadly. Thus, WEA and EAS work in a complementary fashion to distribute emergency notifications using different methods to reach individuals who should be aware of an emergency or incident.

EAS's "daisy chain" leverages broadcasting's architecture to create many redundant paths through which the alert may flow, thus increasing the likelihood the alert is received by all participants. Combined with broadcasting's one-to-many architecture, the EAS daisy chain provides resiliency and redundancy to WEA's one-to-one architecture.

As it has done with EAS, the FCC has also launched efforts to improve and enhance WEA messages.[37] The Commission has explicitly recognized the importance of WEA multimedia content, and in March 2018 sought stakeholder feedback on requiring multimedia content in WEA messages.[38] In 2016, the FCC adopted rules which: expanded the length of text notifications; added an alert classification for "public safety messages"; required participating CMS providers to support embedded references (*i.e.*, URLs and phone numbers) included in alert messages; required participating CMS providers to support transmission of Spanish-language alert messages; and promoted the use of multimedia to enhance WEA alerts.[39] More recently, FCC Chairman Ajit Pai called upon all stakeholders engaged in the provision of WEA alerts to improve the accuracy of such alerts' geographic targeting capability, noting that "[t]he American people want, expect, and deserve the best possible public safety services—including the most precise targeting available for wireless alerts."[40]

HD Radio technology can further improve upon these enhancements for EAS—achieving greater resiliency, redundancy, and accessibility.

4 Upgrades to Public Alerting Enabled by Digital Radio

While each method of public alerting has particular strengths, HD Radio technology is uniquely positioned to enhance the overall system and fulfill many of the important recommendations made by CSRIC in its December 2018 Final Report.

4.1 HD Radio Technology's Public Alerting Capabilities

EAS alerts transmitted with HD Radio technology go far beyond what is possible with analog radio transmissions. First, as the FCC has recognized, "[d]igital radio reception is more resistant to interference and eliminates many imperfections of analog radio transmission and reception."[41] Second, whereas radio broadcasters transmitting EAS messages via an analog-only signal are limited to providing a basic audio message, the digital data capabilities of HD Radio technology enable digital broadcasters to enhance their emergency messaging broadcasts by providing more rich and detailed content, including, for example, alternate languages, message text, pictures, and maps.

Notably, the HD Radio emergency alerting broadcast protocol is completely CAP compliant, thus allowing dissemination of all the rich content facilitated by CAP (*e.g.*, enhanced text notifications, visual information, and multilingual messages) to emergency alert-enabled HD Radio receivers. Specifically, beyond broadcasting audio alerts and messages, HD Radio emergency alerts currently have the capacity to enable:

- Enhanced text notifications, with primary messages able to support up to 374 text characters, thus allowing the urgency, severity, and certainty information of CAP messages to be conveyed to alert recipients. *See Figure 1.* As of January 2019, more than 327 HD Radio stations nationwide are utilizing this feature to send critical alert information to their listeners via priority text notifications.[42]

- ❑ Geographically targeted information, as recommended by CSRIC, which can ensure that an alert is geographically relevant to the recipient and that people traveling into a threat area receive the alert.[43]
- ❑ Multilingual audio and text, as discussed in the CSRIC Report, provided simultaneously on stations supporting digital multicast signals.[44]
- ❑ Setting targeted alert parameters. For example, alerts can be categorized and tailored by subject matter, target audience, severity, and more. Enhancing "relevant" alerts is an "evolutionary recommendation" made by CSRIC.[45]
- ❑ "Wake-up" signaling, a capability "needed to improve public safety" according to CSRIC, which allows an HD Radio-compatible consumer electronics device to automatically wake up from a stand-by mode and notify the user upon receipt of an emergency alert.[46]
- ❑ "Autotuning" capability, which enables a radio user to receive an emergency alert even when the person's radio is tuned to a different station. Many HD Radio receivers can be signaled to tune into a station broadcasting EAS messages, even if the radio was tuned to another station at the time of the EAS broadcast. This ensures that emergency alerts reach listeners, even if they are listening to another station.

In addition, HD Radio technology will soon offer the following enhanced emergency alerting services:

- ❑ Multimedia visual information, including graphics, images, pictures, maps and URL links, as recommended by CSRIC, which can provide enhanced critical information about the timing, location, and severity of a threat.[47] *See Figures 2 and 3* (anticipated in 2020).
- ❑ First Responder alerting: The HD Radio system can send isolated data to specific receivers, thus allowing the establishment of a secure data network for Police, Fire, and other First Responders to receive targeted Situation Reports (SITREPS). This functionality, which is expected to be available within the next two years, also allows encrypted data to be transmitted to targeted First or Second Responder receivers where the data can be extracted via the USB port to a computer and decrypted. *See Figure 4.*

Figure 1: Enhanced Text Notification over a HD Radio FM Transmission

Figure 2: Future Multimedia and Graphic Capability Displaying a Map and Doppler Radar in an Emergency

Figure 3: Future Multimedia and Graphic Capability Displaying an Emergency Evacuation Notification with Map of Area Affected

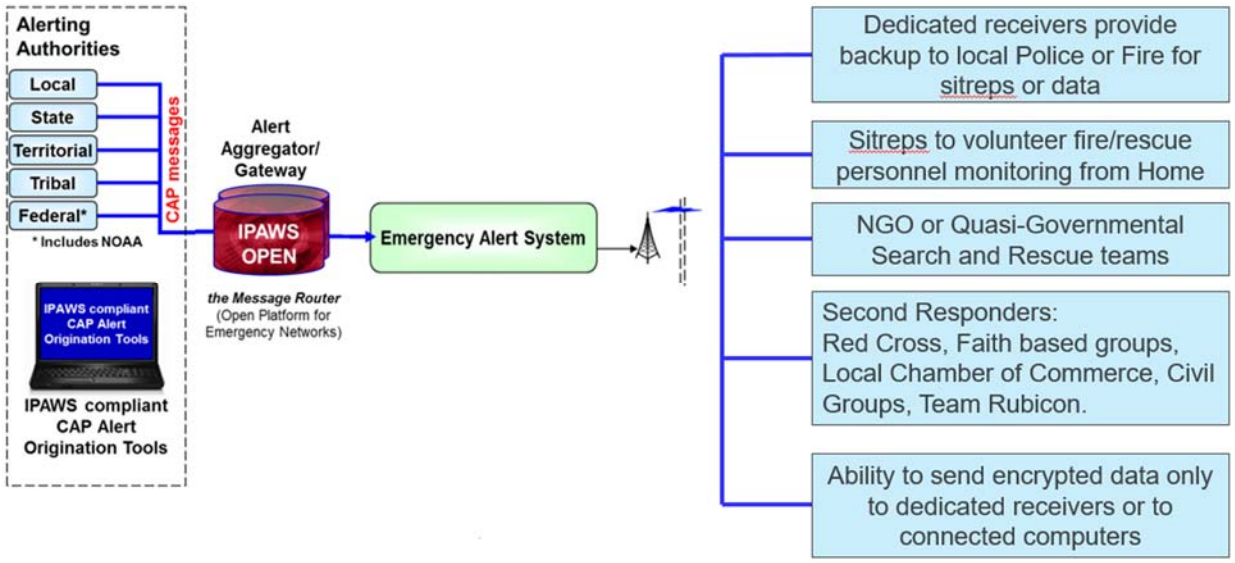

Figure 4: First Responder Alerting Capability

4.2 Emergency Vehicle Warning System

In addition to the enhanced emergency alerting capabilities noted above, HD Radio technology has the capacity for other advanced and innovative emergency alerting services, such as the Emergency Vehicle Warning System (EVWS), the concept for which is described below. The EVWS is just one of many applications enabled by HD Radio technology that are being explored.

4.2.1 Overview

Emergency vehicles are experiencing an increasing challenge in responding to calls due to driver distraction. Traffic delays prevent responders from arriving at the scene quickly. Accidents between emergency vehicles and private vehicles have resulted in numerous injuries, deaths, and settlement expenses. Getting drivers' attention is increasingly difficult as car manufacturers implement solutions to reduce the amount of outside noise in the cabin. Moreover, entertainment systems provide auditory distractions decreasing drivers' awareness of warning sirens. The challenge for First Responders today and in the future is to effectively get the attention of local drivers during an emergency call.

4.2.2 System Concept

With HD Radio technology, companies are developing a novel way of alerting local drivers to an approaching emergency vehicle. The HD Radio EVWS would allow emergency vehicles to transmit a warning message to nearby cars with HD Radio receivers. When combined with other radio features, the EVWS would provide in-car notification of an approaching fire truck, police car, or ambulance–thereby allowing the driver time to respond and avoid accidents and delays.

4.2.3 Technology Summary

The HD Radio EVWS would use a low power HD Radio transmitter and the emergency alert message feature in digital radio receivers to convey warnings. An emergency vehicle would activate an in-vehicle transmitter to broadcast a predefined warning message on a fixed frequency (*e.g.*, 87.9 MHz). HD Radio receivers enabled with the EVWS software would search for the warning transmission, detect the alert, and issue a visual or audible notification to drivers in range of the transmitter.

4.3 Portability & Mobility of HD Radio Technology

In times of emergency, receiving alert messages while on the go is critical. HD Radio receivers include new car infotainment systems, car and home radios, and portable devices. The portability and mobility of HD Radio technology, combined with its enhanced emergency messaging capabilities, makes digital radio broadcasting an extremely important and versatile part of the nation's public alerting ecosystem. Lightweight and portable HD Radio receivers are available today across nearly 100 models and receiver types.[48]

Given their utility, HD Radio receivers can be easily distributed before, during, and after an incident. For example, First Responders and emergency management organizations could distribute receivers to citizens in the path of a coming hurricane, or after the storm has damaged or destroyed cell towers and phone lines, to those people affected by the disaster. Of course, given the ubiquity of mobile phones, if

all such devices included activated digital FM receivers, the ability to reach those in harm's way would be exponentially magnified should the WEA be compromised, thus providing enhanced redundancy in emergency alerting that is so critically important.

4.4 Implementation of HD Radio Emergency Alerting

Radio broadcasting is an efficient, reliable, and cost-effective way to distribute information locally. The infrastructure of one radio station can service one listener, 1,000 listeners, 100,000 listeners, or potentially millions of listeners. By upgrading to transmit digitally, radio stations can vastly enhance their valuable service to the public through the provision of innovative content, community-targeted information, rich multimedia experiences, and qualitatively improved emergency notifications and alerts.

Digital radio stations can implement HD Radio's enhanced emergency alerting functionality with the introduction of an "Alert Processor." The Alert Processor receives the alert content from an authorized source, and then generates the primary alert message, along with any accompanying audio or visual images. The alert message is sent from the Alert Processor to the HD Radio Exporter or, in the case of stations that have implemented other advanced services, the HD Radio Importer. Figure 1 below sets out the station configuration:

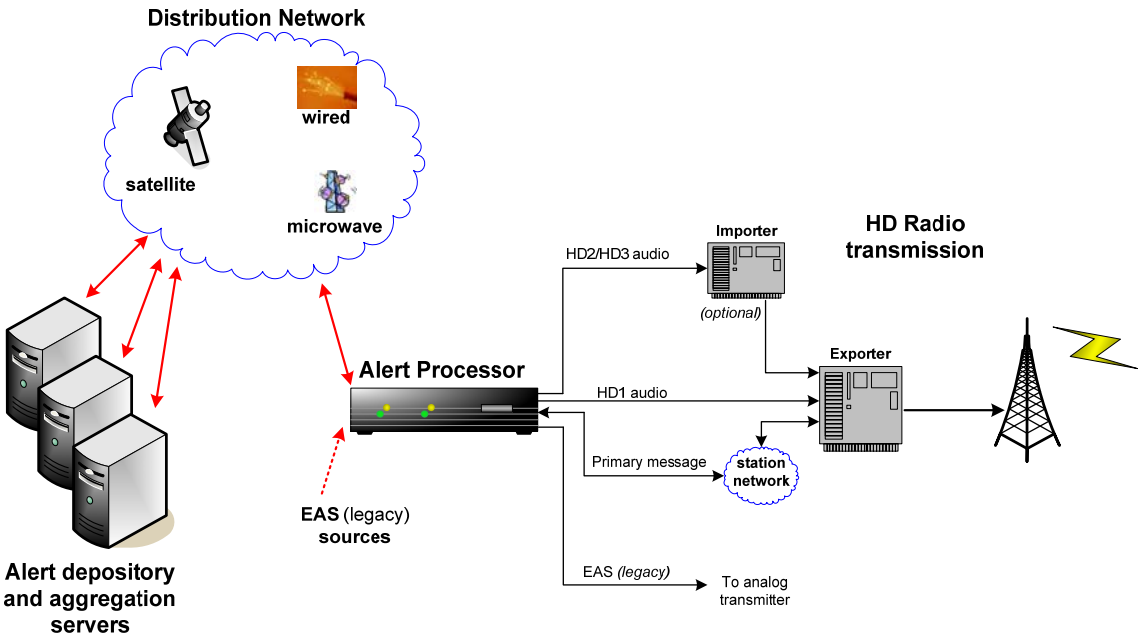

Figure 5: Upgrading to Enhanced Digital Radio Emergency Alerting

Because alerting capability is an integral part of the HD Radio system's audio and data services, any radio station that has implemented digital broadcasting using HD Radio technology can use its existing infrastructure and equipment to add HD Radio's enhanced emergency alerting functionality at little to no additional cost. Existing digital radio stations with compatible digital encoders can enable HD Radio emergency alerting through a simple software upgrade. For stations that have not yet transitioned to

digital broadcasting, the process is simple and relatively inexpensive, at approximately $80,000 to $120,000 per station.

When a station enables HD Radio enhanced emergency alerting capabilities, the station's digital signal "notifies" compatible HD Radio receivers that the station supports advanced emergency messaging (even when no alert is active), thereby preparing such receivers to accept the enhanced text or rich media alert messages sent by the station, as well as the "wake-up" functionality that can turn on the receiver when an alert is transmitted.

4.5 Use Case Scenario

To better demonstrate how the enhanced emergency alerting capabilities of HD Radio technology can be utilized to ensure the public's safety, the hypothetical user story below is illustrative. This use case scenario includes services and features that are available now (i.e., expanded text notifications, geographically-targeted messages and "wake-up" signaling) and anticipated to be available in 2020 (i.e., multimedia visual information, including maps and other images).

As John Brown is pulling into his driveway in the Dayton, Ohio suburb of Beavercreek, a text message begins scrolling across the screen of his in-car entertainment system advising that a severe thunderstorm warning has been issued for the Dayton area during the overnight hours. The enhanced text message includes a map depicting the path of the storm and information about the timing of the storm's path and the specific Dayton suburbs potentially affected. Because the message has been geographically targeted to the Beavercreek area, everyone in John's neighborhood with an HD Radio receiver receives the same emergency text message.

Later that night, before turning off his bedside lamp, John sets the alarm on the battery-operated HD Radio receiver on his nightstand to wake him up at 7:00 a.m. Within a couple of hours, John is fast asleep, unaware that the thunderstorm intensifying outside has caused the power in John's neighborhood to go off. At 3:00 a.m., a tornado warning siren begins blaring, but John doesn't hear it. The noisy storm, and the well-sealed doors and windows of John's home, prevent John from hearing the siren's wail. Within seconds, however, the "wake-up" signaling feature of John's HD Radio receiver is activated, and the receiver springs to life with a state-activated emergency alert audio message warning listeners to take immediate cover. John jumps out of bed, the only light in his bedroom coming from his HD Radio receiver. The receiver's illuminated screen scrolls a text message: "Tornado warning for Dayton and immediate suburbs, including Beavercreek. Seek shelter now." John grabs his smartphone and HD Radio receiver off the nightstand and runs through the dark into his bathroom.

As the house begins to shake, John turns on his digital radio and listens to updates on the tornado's path. John tries to search for additional information on his smartphone, but the Internet is down. John then tries to send a text to his parents who live in a nearby community, but his wireless network service is out and his smartphone is non-responsive. John stays in his bathtub for almost an hour until he hears on his local radio news station that the storm has passed and the tornado threat is gone. Although the storm has passed, John's wireless network service remains unavailable. Unable to reach his parents by phone, John gets into his car to drive to their house. As he backs out of his driveway, the screen of his in-car entertainment system displays a map delivered over his local HD Radio station, which indicates that his parents are not in the affected area. Relieved, John returns to his house to get some rest.

When the sun comes up, John walks outside to assess the damage in his neighborhood. The power is still off, but John continues to get news reports on his digital radio. Throughout the rest of the day, while waiting for the power in his neighborhood to be restored, John relies on his portable digital radio and the digital radio receiver in his car to get updates about the impact of the tornado. In addition to news reports from his local radio station, John gets text notifications about road closures from downed power lines and lists of grocery stores and gas stations in his immediate area that are open.

5 Recommendations for Taking Advantage of HD Radio Technology's Capabilities to Upgrade and Enhance the Nation's Public Alerting System

The strength of EAS remains that it can be used when all other means of alerting the public are unavailable, providing an added layer of resiliency to the suite of available emergency communication tools.

Any effective emergency management and notification plan must include multiple communication methods to reliably convey content to the public. No one method has 100% reliability in 100% of the coverage locations 100% of the time. All methods must be activated to reach the greatest number of potentially impacted parties. However, the unique and critical role terrestrial radio broadcasting plays during times of emergency cannot be overstated. During an emergency, when the power is out, wireless networks are overloaded, or people simply don't have access to a working cellphone, computer or television, a portable, battery-operated or hand-crank radio is the reliable and resilient information source of last resort for the public. Moreover, with the data transmission services enabled by HD Radio technology, when wireless networks are out or overloaded, digital radio broadcasting can serve as a critical back-up data transmission solution. Accordingly, the federal government should pursue policies and/or rulemaking proceedings that advance the emergency alerting capabilities of digital radio. Further, state and local emergency managers should ensure that the enhanced capabilities of digital broadcast emergency alerts are integrated into all emergency alerting system plans and implementations.

The following recommendations should be applied to the extent feasible so as to leverage the advanced capabilities of HD Radio technology to upgrade and enhance the nation's emergency alerting:

- The federal government (FCC/DHS/FEMA) should reiterate that terrestrial radio is an integral part of the public alerting infrastructure due to its portability, reliability, and ease of use and encourage radio broadcasters to implement digital broadcasting and enable HD Radio enhanced emergency alerting functionality.

- FEMA should ensure that HD Radio enhanced messaging capabilities are included in the agency's emergency alerting infrastructure.

- FEMA should encourage the utilization of digital radio broadcasts as a last defense data transmission service in the case of an emergency.

- The federal government should encourage digital radio receiver manufacturers to include all of the enhanced emergency alerting capabilities of HD Radio technology in their products.

- The federal government should explore providing incentives to radio broadcasters to help offset the equipment costs necessary for radio broadcasters to upgrade their facilities to provide HD Radio enhanced emergency alerting capabilities.

- The FCC should encourage EAS Participants to maintain the formatting and content of CAP-generated emergency messages for dissemination via EAS.[49]

- The federal government should encourage the inclusion of digital FM receivers in all radio products (home and automobile), as well as mobile phones.

- The FCC should encourage all state and local EAS management authorities include digital radio emergency alerting capabilities in their state and local EAS plans.

- In view of HD Radio technology's portability advantages, the federal and state emergency management authorities should create and maintain a stockpile of digital radio receivers to distribute in advance of or during emergency situations (*e.g.*, hurricanes, flooding, earthquakes, etc.).

- The FCC should explore assigning FM Channel 200 (87.9 MHz) nationally as a vacant channel for use by a First Responder network and/or Emergency Vehicle Warning Network (*see discussion at Section 4.2).*

6 Conclusion

HD Radio-enabled devices have a profound impact on the nation's overall emergency alerting system. HD Radio technology introduces capabilities which meet and exceed many of the recommendations and requests made by multiple stakeholders, including: Members of Congress, the Federal Communications Commission, the Federal Emergency Management Agency, the Communications Security, Reliability and Interoperability Council, First Responders, and end-users.

The enhancements provided by HD Radio technology enable valuable, rich, multimedia content to get to people when they need it most—in times of emergency—when such information can have lifesaving impact.

Expanding the use and utilization of HD Radio technology can help people before, during, and after disasters and should be a top priority for all stakeholders in the field of emergency preparedness and response.

[1] *See* http://www.hdradio.com/stations/.
[2] *See* http://www.insideradio.com/hd-radio-fm-translators-a-marriage-made-in-tech-heaven/article_2baea754-7845-11e8-8003-db8a924ac769.html.
[3] *See id.*
[4] *See* https://www.prnewswire.com/news-releases/hd-radio-adoption-by-consumers-in-2014-contributes-to-nearly-25-million-units-in-use-driving-new-content-offerings-from-broadcasters-and-high-satisfaction-300015535.html.
[5] *See* http://www.insideradio.com/hd-radio-fm-translators-a-marriage-made-in-tech-heaven/article_2baea754-7845-11e8-8003-db8a924ac769.html.
[6] Derived from Nielsen *Spring 2018 Nationwide Report*.
[7] *See* CSRIC VI Working Group 2 Final Report – Comprehensive Re-imagining of Emergency Alerting - AMENDED, 12-13 (December 13, 2018).
[8] *Id.* at 43-44.
[9] *See* FEMA, Integrated Public Alert & Warning System, https://www.fema.gov/integrated-public-alert-warning-system.
[10] Federal Communications Commission, FCC-CIRC1807-04, at ¶2 (June 21, 2018).
[11] https://www.fema.gov/media-library-data/20130726-1839-25045-9302/eas_best_practices_guide.pdf.
[12] 47 CFR § 11.1. *See Review of the Emergency Alert System*, EB Docket No. 04-296, First Report and Order and Further Notice of Proposed Rulemaking, 20 FCC Rcd 18625, 18628, para. 8 (2005) (*First Report and Order*).
[13] https://www.fema.gov/media-library-data/20130726-1839-25045-9302/eas_best_practices_guide.pdf.
[14] *See* 47 CFR § 11.31.
[15] *See* 47 CFR § 11.18.
[16] *See* FEMA, Integrated Public Alert & Warning System, https://www.fema.gov/integrated-public-alert-warning-system.
[17] https://www.fema.gov/common-alerting-protocol.
[18] *See* 47 CFR § 11.21.
[19] *See* Review of the Emergency Alert System (Fifth Report and Order), 27 FCC Rcd 642 (2012).
[20] *See e.g.* 47 CFR §§ 11.2 (i), 11.51, 11.56.
[21] *See* CSRIC VI Working Group 2 Final Report – Comprehensive Re-imagining of Emergency Alerting – AMENDED, 23-24, 50 (December 18, 2018).
[22] *Id.* at 23.
[23] *Id.* at 6.
[24] FCC, Wireless Alerts and Amendments to Part 11 of the Commission's Rules Regarding the Emergency Alert System, PS Docket Nos. 15-91, 15-94, *Report and Order and Further Notice of Proposed Rulemaking*, FCC 16-12, at ¶7 (Sep. 29, 2016).
[25] https://www.fcc.gov/general/emergency-alert-system-eas.
[26] https://www.fcc.gov/general/emergency-alert-system-eas.
[27] *See* U.S. Dep't of Homeland Security, Build A Kit, https://www.ready.gov/build-a-kit.
[28] *See, e.g.,* FCC, Hawaii Emergency Management Agency False Alert Report and Recommendations: A Report of the Public Safety and Homeland Security Bureau at 9 (PSHSB 2018), https://www.fcc.gov/document/fcc-releases-report-hawaii-false-emergency-alert; FCC, FCC-CIRC1807-04, at ¶42 (June 21, 2018).
[29] *See, e.g.,* Federal Communications Commission, FCC-CIRC1807-04, at ¶1 (June 21, 2018).
[30] *See, e.g.,* https://www.congress.gov/115/bills/s2385/BILLS-115s2385rfh.pdf*; see also* https://www.c-span.org/video/?440768-1/hearing-focuses-effectiveness-emergency-alert-system*;* In July 2018, a bipartisan group of Senators introduced the Reliable Emergency Alert Distribution Improvement (READI) Act of 2018, *see* https://www.schatz.senate.gov/press-releases/schatz-thune-introduce-new-legislation-to-improve-the-way-the-public-receives-missile-alerts.
[31] https://energycommerce.house.gov/news/press-release/subcommtech-examines-future-emergency-alerting/.

[32] Testimony of Antwane Johnson, FEMA Office of Continuity Communications Director before the House Committee on Homeland Security, Subcommittee on Emergency Preparedness, Response, and Communication hearing titled "Ensuring Effective and Reliable Alerts and Warnings" (Feb. 6, 2018), https://www.dhs.gov/news/2018/02/06/written-testimony-fema-house-homeland-security-subcommittee-emergency-preparedness.
[33] https://www.fcc.gov/about-fcc/advisory-committees/communications-security-reliability-and-interoperability-council-0.
[34] CSRIC VI Working Group 2 Final Report – Comprehensive Re-imagining of Emergency Alerting - AMENDED (December 13, 2018).
[35] *Id.* at 52-55.
[36] *See*, *e.g.*, 47 CFR § 10.450 (geo-targeting); 47 CFR § 10.430 (character limit); 47 CFR § 10.400 (classification).
[37] *See* FCC PS Docket Nos. 15-91 and 15-94.
[38] *See* FCC DA 18-302, at 2 (March 28, 2018) at https://www.fcc.gov/document/fcc-seeks-comment-multimedia-content-wireless-emergency-alerts.
[39] *See* https://www.fcc.gov/document/improving-wireless-emergency-alerts-and-community-initiated-alerting-1.
[40] FCC News Release (Feb. 6, 2019) at https://docs.fcc.gov/public/attachments/DOC-356092A1.pdf.
[41] *See* https://www.fcc.gov/consumers/guides/digital-radio.
[42] *See* http://www.hdradio.com/stations/.
[43] CSRIC VI Working Group 2 Final Report – Comprehensive Re-imagining of Emergency Alerting - AMENDED, 41-42 (December 13, 2018).
[44] *Id.* at 48-49.
[45] *Id.* at 56.
[46] *Id.* at 41.
[47] *Id.* at 43.
[48] https://hdradio.com/get-a-radio.
[49] *See* CSRIC VI Working Group 2 Final Report – Comprehensive Re-imagining of Emergency Alerting - AMENDED, 23-24 (December 13, 2018) ("[M]uch of the CAP message extended data is lost once the message is converted to EAS, including alternate languages, message text, pictures, video, maps, etc. … There are several problems that result from the 'down sampling' of CAP to EAS, including deduplication, loss of support for multiple languages and text.").